IN THE CLAIMS:

1 1. (Original) In a service-provider network comprising a plurality of interconnected provider
2 edge routers and transit routers, a router comprising circuitry that:

3   A)   receives from a source not in the service-provider network packets that in-
4   clude destination-address fields that specify final destinations that also are not
5   located in the service-provider network;

6   B)   for each of a plurality of such received packets:

7   i)   makes a routing decision based not only on the contents of that
8   packet's destination-address field but also on the source from which it
9   receives that packet;

10   ii)   inserts into the packet an internal-routing field, determined at least in
11   part in accordance with the source from which the edge router received
12   the packet, that specifies a route to an interface on another of the pro-
13   vider edge routers; and

14   iii)   forwards the resultant packet to another router in the service-provider
15   network in accordance with the routing decision; and

16   C)   receives, from other routers in the service- provider network, packets that in-
17   clude internal-routing fields and destination-address fields and:

18   i)   forwards some such packets without their internal-routing fields to
19   routers, not located in the service-provider network, that it selects in
20   accordance with a routing decision based on the contents of the pack-
21   ets' internal-routing fields; and

22   ii)   for other such packets, makes routing decisions based on the contents
23   of those packets' internal-routing fields without reference to those of
24   their destination-address fields, and, in accordance with those routing
25   decisions, forwards those packets to other routers in the service-
26   provider network.

1   2. (Original)   A router as defined in claim 1 that:

2   A)   makes routing decisions based on the contents of reachability messages that it
3   receives;

4   B)   is connected to at least first and second pluralities of customer routers, with
5   which it respectively associates first and second VPN IDs;

6   C)   when it receives a reachability message concerning a given network-address
7   range from a customer router with which it associates a given VPN ID, sends
8   a reachability message concerning the combination of that network-address
9   range and the given VPN ID to each router in the service-provider network
10   that is connected to a customer router associates with the same VPN ID; and

11   D)   when it receives a reachability message concerning the combination of a net-
12   work-address range and a given VPN ID associated with a customer router to
13   which it is connected, it sends that customer router a reachability message
14   concerning that network-address range.

1   3. (Original)   A router as defined in claim 2 that uses an external gateway protocol to send
2   other routers in the service-provider network the reachability message concerning the combi-
3   nation of network-address range and the given VPN ID.

1   4. (Original)   A router as defined in claim 3 wherein the external gateway protocol that the
2   router uses to send other routers in the service-provider network the reachability message
3   concerning the combination of network-address range and the given VPN ID is the Border
4   Gateway Protocol.

1   5. (Original)   A router as defined in claim 2 wherein:

2   A)   the internal-routing field includes both an egress-router field and an egress-
3   channel field;

4   B)   the router bases its routing decisions concerning the packets that it forwards

5   without reference to their destination-address fields on the internal-routing

6   fields' egress-router fields without reference to their egress-channel fields;

7   and

8   C)   the router bases its selections of the routers not located in the service-provider

9   network to which it forwards packets containing internal-routing fields on the

10   internal-routing fields' egress-channel fields.

1 6. (Original) A router as defined in claim 5 that maintains an information base that associ-

2 ates internal-routing-field contents with routers to which it is connected in the service-

3 provider network and forwards packets containing internal-routing fields to the routers with

4 which the information base associates the contents of those internal-routing fields.

1 7. (Original) A router as defined in claim 6 wherein:

2   A)   the information base associates at least certain internal-routing-field contents

3   with replacement internal-routing-field contents, and

4   B)   the router replaces the certain internal-routing-field contents with the re-

5   placement internal-routing-field contents in packets that it forwards.

1 8. (Original) A router as defined in claim 7 that replaces internal-routing-field contents re-

2 places the contents of some packets' egress-router fields without replacing the contents of

3 their egress-channel fields.

1 9. (Previously Presented) A method for use in a router, said method comprising the steps of:

2   receiving a data packet having a destination address;

3   determining if said data packet is received from a router in a Virtual Private Network

4 (VPN) or a provider network;

5   performing, in response to a data packet received from a VPN router:

4

6   i. adding a forwarding tag based on said destination address and said VPN

7 and forwarding said data packet to another provider router; and

8   performing, in response to a data packet having a forwarding tag received from a pro-

9 vider network router:

10   ii. if said data packet is next being forwarded to another provider router, for-

11 warding said data packet according to said tag to said another provider router; and

12   iii. if said data packet is next being forwarded to said VPN, removing said

13 forwarding tag from said data packet, and forwarding said packet to said VPN.

1   10. (Previously Presented)   The method as in claim 9 further comprising the steps of:

2   receiving reachability messages; and

3   adding said tag in accordance with the contents of said reachability message.

1   11. (Previously Presented)   The method as in claim 9 further comprising the step of:

2   sending to other routers in said provider network a reachability message.

1   12. (Previously Presented)   The method as in claim 11 further comprising the step of:

2   using an external gateway protocol for said reachability message.

1   13. (Previously Presented)   The method as in claim 12 further comprising the step of:

2   using the Border Gateway Protocol (BGP) for said external gateway protocol.

1   14. (Previously Presented)   The method as in claim 9 further comprising: using said router

2 as a transit router.

1   15. (Previously Presented)   The method as in claim 9 further comprising: using said router

2   as a provider edge router.

1   16. (Previously Presented)   A method for use in a router, said method comprising the steps

2   of:

3   receiving a data packet from a router;

4   reading a type field from a header of said packet;

5   if the type field indicates that the packet has a standard router to router type, then add-

6   ing a tag and transmitting to a provider router the tagged packet;

7   if the packet has more than one tag, forwarding the packet to a provider router; and

8   if the packet has only one tag, forwarding the packet to a customer router.

1   17. (Previously Presented)   A router, comprising:

2   an ingress port to receive a data packet originating in a Virtual Private Network

3   (VPN), said packet having a destination address;

4   circuitry to add a forwarding tag to said data packet, said tag based on said destination

5   address and said VPN, said circuitry responding to data packets received directly from a

6   VPN edge router;

7   circuitry to remove a forwarding tag from said data packet, said circuitry responding

8   to data packets next being forwarded to a VPN edge router; and

9   an egress port to forward said data packet according to said tag.

1   18. (Previously Presented)   The router as in claim 17 further comprising:

2   an ingress port to receive reachability messages, wherein said forwarding tag is la-

3   beled in accordance with said reachability message.

1 19. (Previously Presented)   The router as in claim 17 further comprising: said router is in a
2 provider network.

1 20. (Previously Presented)   The router as in claim 19 further comprising:
2   an egress port to send to other routers in said provider network a reachability mes-
3 sage.

1 21. (Previously Presented)   The router as in claim 20 further comprising: said reachability
2 message uses an external gateway protocol.

1 22. (Previously Presented)   The router as in claim 21 further comprising: said external
2 gateway protocol is the Border Gateway Protocol (BGP).

1 23. (Previously Presented)   The router as in claim 17 further comprising: said router is a
2 transit router.

1 24. (Previously Presented)   The router as in claim 17 further comprising: said router is a
2 provider edge router.

1 25. (Previously Presented)   A router, comprising:
2   means for receiving a data packet having a destination address;
3   means for determining if said data packet is received from a router in a Virtual Pri-
4 vate Network (VPN) or a provider network;
5   means for performing, in response to a data packet received from a VPN router:
6   i. adding a forwarding tag based on said destination address and said VPN
7 and forwarding said data packet to another provider router; and

8   means for performing, in response to a data packet having a forwarding tag received

9   from a provider network router:

10   ii. if said data packet is next being forwarded to another provider router, for-

11   warding said data packet according to said tag to said another provider router; and

12   iii. if said data packet is next being forwarded to said VPN, removing said

13   forwarding tag from said data packet, and forwarding said packet to said VPN.

1   26. (Previously Presented) A computer readable media, comprising: said computer readable

2   media containing instructions for execution in a processor for the practice of the method of

3   claim 1 or claim 16.

1   27. (Previously Presented) Electromagnetic signals propagating on a computer network,

2   comprising: said electromagnetic signals carrying instructions for execution on a processor

3   for the practice of the method of claim 1 or claim 16.